

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of :

Mark VERRALL et al. : Group Art Unit: TO BE ASSIGNED

Divisional Application of  
Serial No.: 09/254,185 : Examiner: TO BE ASSIGNED

Filed: May 18, 2001

For: AN ANISOTROPIC POLYMER LAYER (AS AMENDED)

**PRELIMINARY AMENDMENT**

Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

Prior to initial examination, please amend the above-identified application as follows:

**IN THE TITLE**

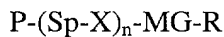
Delete the title in its entirety and insert therefore, --AN ANISOTROPIC POLYMER  
LAYER--.

**IN THE CLAIMS:**

**Please cancel claims 1-13 without prejudice or disclaimer.**

**Please add new claims 14-30 as follows.**

-- 14. An anisotropic polymer layer exhibiting a tilted structure with an optical axis having a tilt angle  $\theta$  relative to the plane of the layer, obtained by polymerizing a polymerizable mesoenic material comprising at least one compound of:



I

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wherein

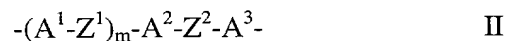
P is a polymerizable group,

Sp is a spacer group having 1 to 20 C atoms,

X is a group of -O-, -S-, -CO-, -COO-, -OCO-, -OCOO- or a single bond,

n is 0 or 1,

MG is a mesogenic or mesogeneity supporting group, optionally, a compound of formula:



wherein

A<sup>1</sup>, A<sup>2</sup> and A<sup>3</sup> are, independently, 1,4-phenylene where one or more CH groups may be replaced by N, 1,4-cyclohexylene, optionally, one or two non-adjacent CH<sub>2</sub> groups are replaced by O and/or S, 1,4-cyclohexenylene or naphthalene-2,6-diyl, optionally these groups are unsubstituted, mono- or polysubstituted with halogen, cyano or nitro groups or alkyl, alkoxy or alkanoyl groups having 1 to 7 C atoms, wherein one or more H atoms may be substituted by F or Cl,

Z<sup>1</sup> and Z<sup>2</sup> are each, independently, -COO-, -OCO-, -CH<sub>2</sub>CH<sub>2</sub>-, -OCH<sub>2</sub>-, -CH<sub>2</sub>O-, -CH=CH-, -C≡C-, -CH=CH-COO-, -OCO-CH=CH- or a single bond, and

m is 0, 1 or 2;

and

R is an alkyl radical with up to 25 C atoms which may be unsubstituted, mono- or polysubstituted by halogen or CN, optionally one or more non-adjacent CH<sub>2</sub> groups are replaced, independently, by -O-, -S-, -NH-, -N(CH<sub>3</sub>)-, -CO-, -COO-, -OCO-, -OCO-O-, -S-CO-, -CO-S- or -C≡C- where oxygen atoms are not linked directly to one another, or alternatively, R is halogen, cyano or has independently one of the meanings given for P-(Sp-X)<sub>n</sub>.

15. A polymer layer according to claim 14, wherein the tilt angle  $\theta$  in each of said layers varies continuously in a direction normal to the layer, starting from a minimum value  $\theta_{\min}$  at the side of the layer facing the other layer or, if present, the common substrate, and ranging to a maximum value  $\theta_{\max}$  on the opposite side of the layer.

16. A polymer layer according to claim 14, wherein the minimum tilt angle  $\theta_{\min}$  is from 0 to 20 degrees.

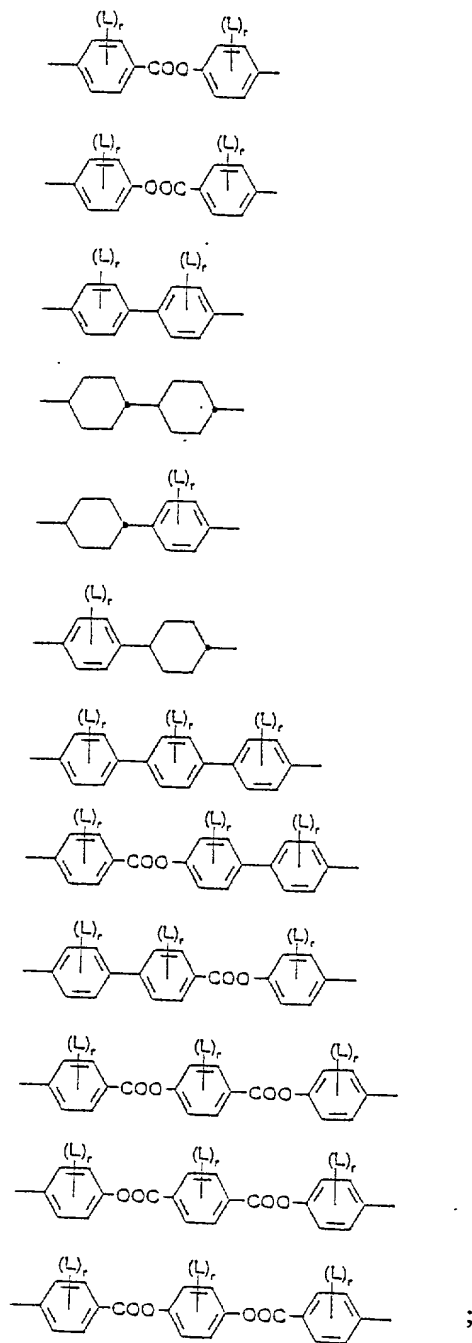
17. A polymer layer according to claim 14, wherein the maximum tilt angle  $\theta_{\max}$  is from 20 to 90 degrees.

18. A polymer layer according to claim 14, wherein the tilt angle  $\theta$  is substantially constant and is in the range from 5 to 80 degrees.

19. A polymer layer according to claim 14, wherein the polymerizable material comprises at least one compound of formula I having one polymerizable group and at least one compound of formula I having two polymerizable groups.

20. A polymer layer according to claim 14, wherein the polymerizable material comprises at least one compound of formula I wherein the mesogenic group MG is of the formulae:

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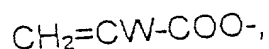
or

where L is: F, Cl, CN, or an optionally fluorinated alkyl, alkoxy or alkanoyl group with 1 to 4 C atoms,

and

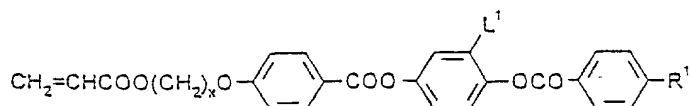
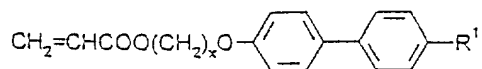
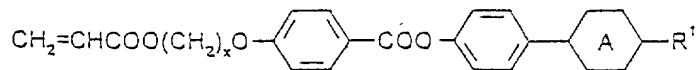
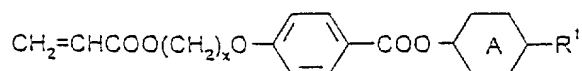
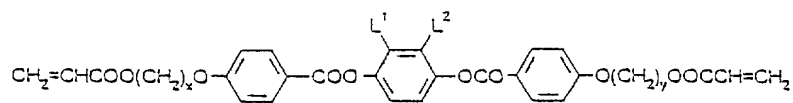
r is 0, 1 or 2.

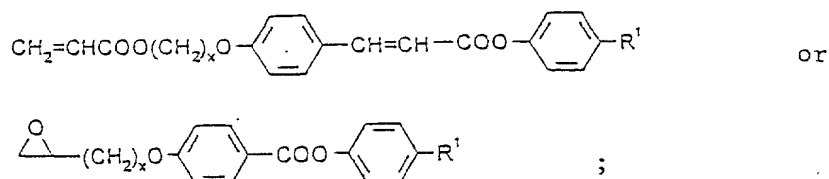
21. A polymer layer according to claim 14, wherein the polymerizable material comprises at least one compound of formula I where P is:



$\text{WCH}=\text{CH}-\text{O}-$ ,  $\text{WHC}-\text{CH}-$  or  $\text{CH}_2=\text{CH}-\text{Phenyl}-(\text{O})_k-$  with W being H,  $\text{CH}_3$  or Cl and k being 0 or 1.

22. A polymer layer according to claim 14, wherein the polymerizable mesoenic material comprises at least one compound of the formulae:





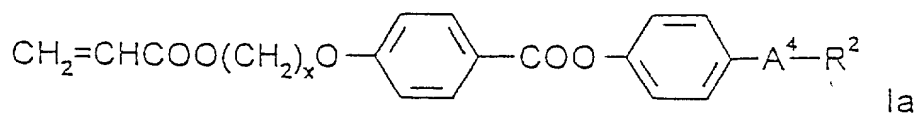
wherein x and y are, independently, 1 to 12, A is a 1,4-phenylene or 1,4-cyclohexylene group, R<sup>1</sup> is halogen, cyano or an optionally halogenated alkyl or alkoxy group with 1 to 12 C atoms, and L<sup>1</sup> and L<sup>2</sup> are, independently, H, F, Cl, CN, or an optionally halogenated alkyl, alkoxy, or alkanoyl group with 1 to 7 C atoms.

23. A polymer layer according to claim 14, wherein the polymerizable material comprises 1 to 80% by weight of at least one dielectrically positive monoreactive mesogenic compound.

24. A polymer layer according to claim 23, wherein said dielectrically positive monoreactive mesogenic compound has a dielectric anisotropy  $\Delta\epsilon > 1.5$ .

25. A polymer layer according to claim 23, wherein said dielectrically positive monoreactive mesogenic compound has a polar terminal group of CN, F, Cl, OCF<sub>3</sub>, OCF<sub>2</sub>H, OC<sub>2</sub>F<sub>5</sub>, CF<sub>3</sub>, OCN or SCN.

26. A polymer layer according to claim 14, wherein the polymerizable material comprises at least one compound of the formula:



wherein x is 1 to 12, R<sup>2</sup> is C<sub>1-12</sub> alkyl or alkoxy, and

A<sup>4</sup> is 1,4-phenylene, trans-1, 4-cyclohexylene or a single bond;

at least one di reactive compound of formula I; and at least one dielectrically positive monoreactive compound of formula I.

27. A polymer layer according to claim 14, wherein the polymerizable mesoenic material is a mixture of:

a1) 10 to 99% by weight of at least one mesogen according to formula I having one polymerizable functional group,

a2) 0 to 70% by weight of at least one mesogen according to formula I having two or more polymerizable functional groups, and

b) 0.01 to 5% by weight of an initiator.

28. A polymer layer according to claim 14, wherein the polymerizable mesoenic material is a mixture of:

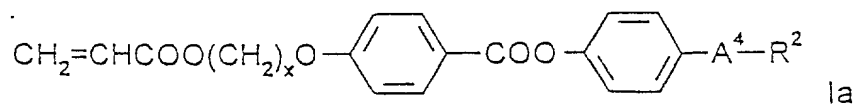
a1A) 10 to 65%, by weight of at least one compound of formula I having one polymerizable group, wherein R is an alkyl or alkoxy group with 1 to 12 C atoms;

a1B) 5 to 40% by weight of at least one compound of formula I having one polymerizable group, wherein R is CN, F, Cl or a halogenated alkyl or alkoxy group with 1 to 12 C atoms;

a2) 2 to 90% by weight of at least one compound of formula I having two polymerizable groups, wherein R has one of the meanings of P-(Sp-X)<sub>n</sub>; and

b) 0.01 to 5 % by weight of an initiator.

29. A polymer layer according to claim 28, wherein the compound a1A) is of the formula:



wherein x is 1 to 12, R<sup>2</sup> is C<sub>1-12</sub> alkyl or alkoxy, and

A<sup>4</sup> is 1,4-phenylene, trans-1, 4-cyclohexylene or a single bond.

30. A liquid crystal display comprising a display cell and at least one polymer layer according to claim 14. --

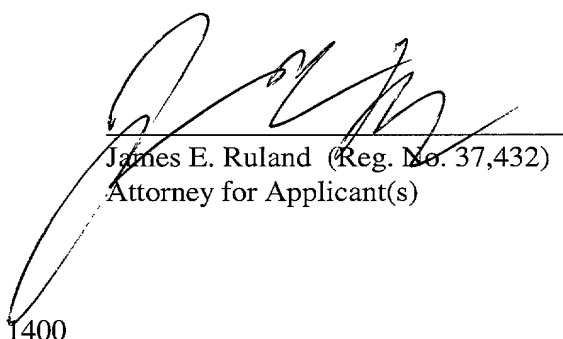


**REMARKS**

The principal purpose of this amendment is to present claims withdrawn by the Office in Application No. 09/254,185.

The Commissioner is hereby authorized to charge any fees associated with this response or credit any overpayment to Deposit Account No. 13-3402.

Respectfully submitted,



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